

1. Watershed Name:
Dungeness River Watershed

Hydrologic Unit Code:
17110020

2. Nominee Contact Information:

Lyn Muench
Water Quality Planner
Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382
360-681-4631
lmuench@jamestowntribe.org

Shawn Hines
Watershed Planner
Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382
360-681-4664
shines@jamestowntribe.org

Valerie Streeter
Water Quality Planner
Clallam County
223 East 4th Street
Port Angeles, WA 98362
360-417-2543
vstreeter@co.clallam.wa.us

3. Nomination devoted to hypoxia in the Gulf of Mexico?
No.

For over 15 years, community members have worked to restore ecosystem functions to the Dungeness Watershed, located on the Olympic Peninsula of Washington State. Although progress has occurred via collaborative partnerships among tribal and other governments, non-profit groups, landowners and others - impaired water quality, bay shellfish closures and dwindling salmon runs persist. Floodplain development, failing septic systems, impaired instream flows, and pollution from residential and agricultural stormwater runoff contribute to these problems. Based on strategies within our Watershed Plan, our proposal examines solutions to address several linked watershed threats at once. Tasks include: (i) a microbial source tracking study, to more precisely define pollutant sources, (ii) innovative BMP demonstrations (and market-based incentives for BMP implementation) related to stormwater, septic maintenance, water treatment and water conservation, and (iii) an effectiveness study, to compare cost and effectiveness of the demonstrated BMPs. Results will be shared according to a thorough outreach plan.

A - DUNGENESS WATERSHED AND WATERSHED PLANNING EFFORT

1. **Watershed Characteristics:** **The Dungeness Watershed (~200mi²) is located on the Olympic Peninsula of northern Puget Sound in Washington State (A-D1)*. The River originates in the steep mountains of Olympic National Park and flows 32 miles through wilderness, forest and the Sequim Valley before reaching its bay, partially within the boundary of Dungeness National Wildlife Refuge. The Watershed provides for over 200 fish/wildlife species, and is an important stop for migratory waterfowl. The River supports 7 Puget Sound salmonid species, and the Bay is noted for bountiful crab and other shellfish. The area has steadily converted from forest to agricultural and residential land uses, and is rapidly urbanizing (A-D2). Residents (including 22% retiree) and visitors enjoy a variety of recreational activities in a mild, sunny climate within the rain-shadow of the mountains. An extensive irrigation system, diverting river water for lawns, crops and hobby farms, adds to the pastoral setting of the valley. The Jamestown S'Klallam Tribe, historically dependent on the watershed's cultural and natural resources, retains treaty rights to fish, hunt and gather shellfish here.**

2. **Problems/Threats:** Human-induced impacts to the Dungeness Watershed have impaired its natural river and bay processes. Land use changes and physical alterations, such as *floodplain development, riparian vegetation removal* and construction of an extensive *irrigation system (A-D3)*, are factors in *flooding, stormwater pollution* and overall *degraded aquatic habitat*. *Failing septic systems, poor animal keeping practices* and inadequate management of *stormwater runoff* have increased *nutrient and bacterial levels* in the River, Bay and irrigation ditches. Like many Puget Sound basins, the Dungeness is 303(d)-listed for *fecal coliform* and *low in-stream flows*. This combination of watershed health problems has resulted in *human risk, three threatened salmonid species* under ESA, and *closure of Dungeness Bay (A-D4)* to tribal and non-tribal shellfish harvests, *inhibiting economic and recreational use of the River and Bay*.

3. **Watershed Plan Description:** The Dungeness River Management Team, the watershed council established by the Tribe and County in 1988, recently completed the East WRIA 18 portion of the

* A-D1 stands for Appendix D-1; hereafter, all appendix references will be abbreviated as such. Technical references cited are in A-E1.

focuses on four *interrelated* watershed issues: Water Quality (WQ), Water Quantity, Habitat and In-stream Flows. With the aim of addressing *linked watershed problems*, we base this Initiative proposal on

two strategies the Plan encompasses. The first, *Clean Water Strategy for Addressing Fecal Coliform*ⁱⁱ, is the basis for two TMDL *Cleanup Plans* and coordinates actions to address non-point source pollution. The second, *Comprehensive Irrigation District Management Plan*ⁱⁱⁱ (A-E2), is an incentive-based approach for the irrigation community to manage their system in light of both the ESA and Clean Water Act. Our proposal shares specific **long-term goals** of the Watershed Plan: *improved WQ in Watershed and Bay to meet shellfish harvest- and freshwater-standards; stormwater impact mitigation; and improved in-stream flows for ESA-listed fish*. **Short-term goals** include: *pollutant source ID; application of innovative BMPs; improved irrigation system efficiency; and enhanced public awareness of pollutant sources and pollutant prevention techniques*.

4. Assessments, Plans to Date: The 2003 *Watershed Plan* draws from numerous earlier efforts. A *Dungeness River Area Watershed Plan*^{iv} was developed to encourage and coordinate watershed WQ improvement. The *Dungeness-Quilcene Plan*^v made recommendations on other water resource issues and led to *Recommended Restoration Projects for the Dungeness River*^{vi}, focusing on habitat and restoration. Subsequent efforts work to implement these plans, while attempting to more precisely identify non-point pollutant sources. Partners increased WQ monitoring in the River, Bay and ditches; a Clean Water Workgroup created a *Clean Water Strategy*; and TMDLs^{vii} were supplemented with *bathymetric studies*^{viii} to analyze water circulation and marine bacterial movement. The County offers *outreach* on septic issues, and the Conservation District (CD) helps develop *farm plans* and *incentives* for BMPs. The irrigators work with the CD and Tribe to implement their *Water Conservation Plan*^{ix} and with additional entities on *Comprehensive Irrigation District Management Planning*. Local biologists developed *Recommended Land Protection Strategies for the Dungeness River*^x, which prioritizes lands for the protection of important riparian functions (e.g. filtering pollutants in runoff and providing critical habitat).

B - DESCRIPTION OF PROPOSED PROJECTS (Itemized budget tables are in A-E3).

We selected the combination of activities below based on: the degree to which they embrace an *innovative, cost-effective* restoration approach; their potential for *success*; and their ability to address *several priority watershed issues* at once, while working to achieve the goals of the *WRIA 18 Watershed Plan*.

(1) Microbial Source Tracking (MST) Study: Numerous studies have shown that the fecal contamination within the Dungeness Watershed and Estuary comes from multiple sources, including but not limited to: humans (failing septics), pets, livestock, and wildlife. Failure to specify which sources predominate has resulted in skepticism among citizens about the studies and about the utility of pollution prevention BMPs. As a pollutant conveyor, the irrigation system presents a further layer of complexity, both as a technical challenge and as a public perception issue. A 2003 study^{xi} that looked at the feasibility of various bacterial source ID methods recommended RNA ribotyping, an emerging biotechnology (A-E4) which provides species-specific ID of target organisms, and could help refine mitigative measures for cleanup within the Dungeness. Refining the methodology for this complex watershed would have direct application to other Puget Sound watersheds facing shellfish closures and elevated bacterial problems. We propose to apply an intensive, targeted ribotyping study within the lower Dungeness Watershed and Estuary over a two-year period. Six sites (A-D5) have been selected based on certain criteria: (i) areas highlighted in the *Dungeness River and Matriotti Creek TMDL Study*, (ii) areas where *targeted results* could lead to significant BMP improvements, (iii) areas with significant fecal contamination and unidentified predominant sources, and (iv) areas of suspected failing septics, where source ID would provide the necessary data for public *outreach* efforts and *incentives* for proper sewage disposal. Monthly *E.coli* ribotyping sampling, to occur in conjunction with routine fecal coliform and nutrient analyses at these sites, will be supplemented by samples taken during or after storm events. We will modify sampling during the second year based on *results* of the first year. Overall MST source-ID *results* will be applied in the

BMP Effectiveness Monitoring study, described below (*Project 3*). **Budget:** \$141,621. Includes *E. coli* sampling (required for bacterial source tracking), sample plan design, lab analysis, reporting.

(2) Innovative Best Management Practices Demonstrations: We propose to demonstrate four pollution prevention techniques, as described below (a - d):

a) *Myco-remediation*: Myco-remediation is a promising, *innovative* biotechnology that prevents contaminants from entering surface or groundwaters by conditioning live native fungi to consume and filter specific pollutants carried to riparian areas by stormwater (*A-E5*). We will evaluate fungal applications to prevent movement and reduce levels of two types of contaminants in the Dungeness: (i) excess nutrients (Nitrogen and Phosphate) and (ii) fecal coliform bacteria. We will select one of two identified sites (*A-D5*) based on data from the *Bay TMDL* as well as additional nutrient data and analysis. Fungi and other native plants will be applied at the mouth of a culvert or along riparian banks where excess nutrient- and fecal coliform bacteria-runoff (from agricultural or other sources) have been a problem, and where these areas have been stripped of their natural vegetation. In addition to improved WQ (from reductions in excess nutrients and bacteria), this *innovative* treatment will benefit salmon and other aquatic organisms by providing native vegetation (i.e. improving habitat) within riparian zones. *Results* will be used, in part, to identify future appropriate application sites. **Budget:** \$57,693. Includes planning, fungal preparation/planting/maintenance, lab analysis.

b) *Homeowner Sewage Management BMPs*: This project involves 3 elements: (i) education and cost-share incentives, (ii) professional septic maintenance training, and (iii) development of a *market-based* tool for homeowner decision-making on sewage management alternatives.

(i) Residents living in areas with impaired WQ (as established by TMDL and other monitoring) who attend one neighborhood County *septic education course* (offered three quarters per year) will receive *cost-share* for: septic inspection, viewing ports (risers), maintenance and minor repairs. *Cost-share* will include reimbursement of 50% of the expenses, up to a maximum amount per

cost-share item. Depending on the extent of necessary repairs, the County may waive the cost of the repair permit (\$150). Follow-up questionnaires will be mailed to homeowners to determine whether lifestyle improvements (laundry load spacing; proper disposal of medications, etc.) were achieved. We will monitor WQ in nearby surface waters, and compare this data with historical records to help determine *environmental results*. This monitoring will be budgeted under *Project 3*.

(ii) O&M Maintenance Agreements will be encouraged and facilitated through Clallam County: The County O&M specialist will provide *training to industry professionals* on maintenance of alternative sewage management systems; few industry professionals in the County have completed training on these systems, due to training cost and distance to training sites. After training, the Specialist will work with these professionals to develop a program for processing O&M maintenance agreements with homeowners who own septic systems with pumps. The County will develop *market-based incentives* for homeowners to arrange for O&M Agreements with local professionals. The Specialist will conduct dye testing of septic systems as needed to identify or confirm suspected failures. In the case of a low- to moderate-income landowner with a failing septic system, the Specialist will work with the landowner to obtain funding and facilitate repair and cleanup.

(iii) The Tribe will produce a *market-based incentive guide to property owners* that will help existing and new homeowners decide upon sewage management alternatives. Many citizens reject community systems or advanced sewage treatment and yet fail to maintain conventional systems, unaware of consequential indirect costs. The proposed guide will cost out options for sewage management and disposal (e.g. land cost, system installation, system maintenance, system repair) over a 20-year period so as to reveal the actual expenses of sewage disposal and demonstrate to watershed residents the economic wisdom of utilizing community septic systems, creation of third party maintenance agreements for alternative systems, and consistent maintenance of conventional systems. By clearly documenting the true costs of these options, we hope to build community

support for O&M maintenance of all types. **Budget:** \$383,395. Includes septic education costs, dye testing, cost-share, O&M Specialist, lab analysis. The *market-based incentive* guide is budgeted within Public Outreach.

c) Stormwater BMP Demonstrations: This project involves planning, design, and installation of three stormwater demonstrations (A-D5): (i) Homeowner Stormwater BMPs, (ii) Roadside Stormwater Management Practices and (iii) Low Impact Development (LID) Parking Lot Options. The first component will demonstrate a variety of *residential stormwater BMPs* at an existing residential development that drains into Dungeness Bay. Homeowners will participate in all phases of the project, from site assessment and planning to conduction of tours and project monitoring. The second component, targeting private road owners and managers, involves a *roadside demonstration site* showcasing a variety of road-related stormwater management BMPs. The CD and Clallam County Road Department will collaborate on site and BMP selection and design. The site will be used to evaluate the effectiveness, as well as maintenance requirements of, various stormwater management practices appropriate for treating runoff from roads. The third component will demonstrate LID parking lot options for a lot to be installed at the Dungeness River Audubon Center, adjacent to a segment of the Olympic Discovery Trail. All three demonstrations will provide interpretive signs that will detail the prescribed practices, and each will involve at least one organized site tour. They will be publicized in local newspapers and partner newsletters. Anticipated demonstration outcomes include increased public understanding of roadside and homeowner contribution to stormwater runoff, as well as the appropriate BMPs available for preventing pollution from stormwater runoff. **Budget:** \$44,608. Includes site plans, BMP design, monitoring/lab analysis, signs, site tours, media.

d) Irrigation Ditch Piping Demonstration: A special need in our watershed is to consider irrigation management in working toward comprehensive pollution prevention. The WQ and in-stream flow impairments to which irrigation operations contribute can be addressed simultaneously

via irrigation ditch piping. By consolidating two *open* main irrigation canals into a single, *enclosed* main canal (replacing ~18,000 ft of open ditch with enclosed pipeline), this project will demonstrate that enclosed pipe networks prevent pollutants from entering the irrigation system, by which otherwise they would be delivered to the River and Bay. Using *TMDL* and other WQ monitoring data, in addition to information from the *Water Conservation Plan*, the Conservation District prioritized areas in the system where both WQ contamination *and* ditch leakage occur. The site selected for this proposal (*A-D5*) is based in part on this prioritization list. For safe shellfish harvest in the Bay, the River *TMDL* evaluation requires a geometric mean (GM) target of 13 fecal coliform (fc)/100mL. This project will prevent, at minimum, a GM load of 36 fc/100mL from reaching the River. It will also improve in-stream flows by eliminating water leakage, thereby conserving *at least* 3.25 cfs of River water¹. **Budget:** \$700,000. Includes engineering, supplies, construction, lab analysis.

(3) Effectiveness Monitoring Study: The *monitoring and evaluation component* of our proposal includes an Effectiveness Monitoring Study. Battelle Marine Sciences Laboratory will analyze *environmental results* of the MST study and BMP demonstrations (*Projects 1 and 2*) and determine their effectiveness based on reductions in nutrient and bacterial loading, improvement to in-stream flows, and community response to public *outreach* efforts. Before and after BMP installation, technicians will conduct monitoring² at ambient, post-TMDL-monitoring stations immediately upstream and downstream of each BMP site (monthly and during storm events). TMDL and other past monitoring provide excellent flow and bacteria baseline data, but we will expand our *nutrient* baseline data with this proposal (which will be useful in *Projects 1 and 2*). **Budget:** \$279,891. Includes bacterial and nutrient data collection and analyses (both past and new data associated with proposal), data entry into EPA's STORET database, land cover geospatial analysis, reporting.

¹ Biologists analyzing *In-stream Flow Incremental Methodology* results indicated that when flows are below 100 cfs, each cfs is generally equal to nearly 1.0% of optimum available chinook spawning area.

² Sample collection and monitoring for *Projects 2 (a-d)* is accounted for in the *Project 3* budget.

Three-Year Implementation Schedule:

	Sep'04 – Aug'05				Sep'05 – Aug'06				Sep'06 – Aug'07			
Quarter (1=Sept – Nov, 2=Dec – Feb, etc)	1	2	3	4	1	2	3	4	1	2	3	4
1. Microbial Source Tracking Study												
Sample plan design	✓											
<i>E.coli</i> bacterial source collection (knowns)		✓	✓	✓	✓	✓	✓	✓				
<i>E.coli</i> water sample collection (unknowns)			✓	✓	✓	✓	✓	✓	✓	✓		
Preliminary report; Modification of sample plan					✓							
Final reporting											✓	✓
2a. Myco-remediation Demo												
Plan, site layout, plant/fungi selection finalized	✓	✓										
Site construction & planting		✓	✓	✓								
Sample collection and bacterial monitoring		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Site maintenance				✓				✓				✓
2b. Septic BMPs												
Septic courses & follow-up questionnaire	✓	✓	✓		✓	✓	✓		✓	✓	✓	
BMP incentives (installation)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Maintenance training on alternative systems		✓				✓				✓		
Development & circulation of market-based tool	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2c. Stormwater BMPs												
Final BMP-design planning	✓											
Preliminary monitoring	✓	✓										
BMP installation		✓	✓									
Post installation monitoring			✓	✓	✓	✓			✓	✓		
2d. Irrigation BMP Demo												
Engineering plans finalized	✓	✓	✓	✓								
Preliminary flow & bacterial monitoring	✓	✓	✓	✓								
Construction					✓	✓	✓					
Post construction monitoring								✓	✓	✓	✓	✓
3. Effectiveness Study												
Additional baseline nutrient data collection	✓	✓	✓	✓								
Nutrient & bacteria coliform monitoring			✓	✓	✓	✓	✓	✓	✓	✓		
Data analysis & BMP comparisons					✓	✓	✓	✓	✓	✓	✓	
Reporting results (& STORET data entry)											✓	✓

C - PROJECT MANAGEMENT

Shawn Hines, Watershed Planner for the Tribe, will be *administrative lead* and the *fiscal agent to receive funds*. She will also assist in the ditch-piping task (*Project 2d*). Shawn is Coordinator for the DRMT, participates in the CIDMP and 2514 WRIA 18 watershed-planning processes, and has managed water conservation grants for the irrigation community for over 2.5 years. Shawn has also managed

numerous other WQ and habitat grants from Ecology, SRFB and the Bureau of Indian Affairs.

Joe Holtrop, District Manager for the Clallam Conservation District (CD), has extensive experience working with landowners on a variety of projects such as stormwater management planning, riparian restoration, farm conservation planning and agricultural BMPs. Joe is also an advisory member of the DRMT and an active participant in the CWWG and the CIDMP process. Joe will manage the stormwater BMP demonstrations (*Project 2c*), as well as the ditch-piping task (*Project 2d*).

Lyn Muench, Environmental Planning Manager for the Tribe, is a key leader in the Dungeness TMDL process. She manages the Tribe's EPA-funded WQ program and has worked cooperatively for many years with the CD, County and others to design and implement watershed protection and restoration projects. Lyn, also a Board member of the Dungeness River Audubon Center, will provide general technical assistance, and will focus on septic BMPs (*Project 2b*) and *public outreach*.

Valerie Streeter, Watershed Planner for the County, Coordinator for the West WRIA 18 watershed council, and chair of the Clean Water Work Group, will serve as *co-lead* for this proposal. She has managed several WQ grants, including preliminary studies on MST and sediment pollutants. She also has significant experience in environmental assessments, data analysis, and *outreach*. Valerie will assist in the MST study (*Project 1*), the septic BMPs (*Project 2b*), and the Effectiveness Study (*Project 3*).

Dr. Susan Thomas, of Battelle Marine Sciences Laboratory (Battelle), leads a research team that studies myco-remediation. She introduced the concept to Battelle in 1996, and has since managed a dozen related research projects. Susan has extensive experience in environmental assessment and reporting, environmental planning, and science education including workshop and lecture presentations. She will direct the myco-remediation component (*Project 2a*) and its related *outreach*.

Dr. Dana Woodruff, Senior Research Scientist with Battelle, will be task leader for the MST study (*Project 1*) as well as the Effectiveness Monitoring Study (*Project 3*). She has over 20 years experience conducting applied research in coastal assessment and WQ. She has managed programs for NOAA,

Department of Energy, and various state, local and private agencies. She has been a Clean Water Workgroup member since its inception, and she led the 2003 MST feasibility study for the County.

D - OUTREACH ACTIVITIES: The Clean Water Strategy provides the framework for our *public outreach* plan. We will focus on three goals from its *public outreach* section: (i) Provide information on Dungeness Bay bacterial pollution and prevention (and associated human-health risks); (ii) Inform watershed residents on where to find local remediation services and which state/local agencies are involved in water cleanup; and (iii) Facilitate long-term partnerships among agencies and community groups. Complementing outreach activities referenced in the project descriptions (Section B of this proposal), we will use five tools to meet our *outreach* goals: a newsletter (the Clean Water Herald); local workshops for adults and children; a permanent display (at the Dungeness River Audubon Center); the River Center's website; and presentations to regional colleagues. The **newsletter**, mailed to all 25,000 watershed residents, will integrate project results with other related WQ activities in the Watershed. **Open public workshops**, including site visits, will be held on the following topics: an *incentive-* and *market-based* assessment of home-maintenance options; *innovative BMPs* for rural riparian landowners; the state of WQ in the Watershed; and *results* of the BMP Effectiveness Study. The talks will be sponsored by the River Center, in cooperation with project partners. The Center will also organize two BMP-related science activities per year for school children. In addition to the interpretive signs planned for the stormwater BMP demonstration sites, a **permanent revolving display** at the Center will showcase the *innovative* projects and *environmental results* as they occur. This will reach the 15,000 visitors (~50% from outside the local area) who visit the Center per year. Project *results* will also be described in a special section of the Center's **website**. **Presentations** on project status/outcomes will include two talks or papers per year by one or more partners at regional natural resource and WQ forums. This will help to *transfer knowledge* (gained from project *results*) to professional colleagues in other Puget Sound and northwest watersheds.

References Cited:

- ⁱ Entrix, Inc. 2003. *Water Resource Inventory 18 Elwha-Dungeness Watershed Plan*. (Draft) Port Angeles, WA.
- ² Clean Water Work Group. 2000. *Clean Water Strategy for Addressing Fecal Coliform in Dungeness Bay and Watershed*. Port Angeles, WA.
- ⁱⁱⁱ Economic Engineering Services, Inc. 2003. *Comprehensive Irrigation District Management Plan (Draft)*. Olympia, WA.
- ^{iv} *Dungeness River Area Watershed Plan*
- ^v Dungeness-Quilcene Regional Planning Group. 1994. *Dungeness-Quilcene Water Resources Management Plan*. Sequim, WA.
- ^{vi} Dungeness River Restoration Work Group. 1997. *Recommended Restoration Projects for the Dungeness River*. Sequim, WA.
- ^{vii} Sargeant, Debby. 2002. *Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study*. Washington Department of Ecology Publication #02-03-014. Olympia, WA.
- ^{viii} Rensel Associates Aquatic Science Consultants. *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies*. 2001 (Phase I) and 2003 (Phase II). Arlington, WA.
- ^{ix} Montgomery Water Group, Inc. 1997. *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan*. Sequim, WA.
- ^x Hals, H. Dungeness River Restoration Work Group. 2003. *Recommended Land Protection Strategies for the Dungeness River*. Sequim, WA.
- ^{xi} Woodruff, D. and Evans, N. Battelle Marine Sciences Laboratory. 2003. *Potential Application of Microbial Source Tracking Methods to the Dungeness Watershed and Bay, Clallam County, WA*. Richland, WA.